INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: A Qualitative Guide to Chaos.
Speaker: Professor Dr. Michael Small.
Date: 20/3/2024 (Wednesday).
Time: 2.30 pm – 3.30 pm.
Venue: MM3, Level 2, Institute of Mathematical Sciences, Faculty of Science, Universiti Malaya.

ABSTRACT

Applied mathematics involves building models of the real world. When those models consist of differential equations (as they very often do) one can seek to do one of two things: (1) make approximations that allow those models to be solved on a restricted, but still useful, domain; or (2) study those equations and offer a descriptive understanding of the dynamics of the underlying system. Increasingly, our ability to collect data is exceeding our skill at constructing viable and interesting systems of equations. I will describe the situation where we have a stream of observed time series data but insufficient expertise to write down an appropriate generating set of equations. From that stream of data, I will describe methods we have been working on that offer a descriptive understanding of the dynamics equivalent to what might've been obtained from the equations. For chaotic systems, we seek to estimate quantities such as Lyapunov exponents, (unstable) periodic orbits, symbolic dynamics, correlation dimension, and attractor topology directly from the data. This allows us to describe the behaviour of the underlying system from observed data, and - importantly for practical applications - quantify change in that behaviour.

All are Welcome